

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-287308

(43)Date of publication of application : 16.10.2001

(51)Int.Cl.

B32B 27/00  
B32B 9/00  
B32B 27/30  
C08F 2/44  
C08F290/04  
C08K 9/04  
C08L101/02  
C09C 1/28  
C09C 3/08  
C09D 4/02  
C09D 4/06  
C09D 7/12  
C09J 7/02  
G02B 1/10  
G02B 1/11  
// C09D183/07

(21)Application number : 2001-028059

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(22)Date of filing : 05.02.2001

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(30)Priority

Priority number : 2000027494 . Priority date : 04.02.2000 Priority country : JP

(54) PLASTIC LAMINATE AND IMAGE DISPLAY PROTECTING FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a plastic laminate having surface hardness, scratch resistance and abrasion resistance and suitably used as the image display protecting film of an image display apparatus of every kind.

SOLUTION: The plastic laminate is constituted by laminating a hard coat layer on at least the single surface of a plastic base material and the surface hardness of the hard coat layer is 2H or more and the surface shaving index thereof is 1.0-15.0. This plastic laminate is used as the image display protecting film.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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**CLAIMS**

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[Claim(s)]

[Claim 1] The plastics layered product characterized by for table facing \*\*\*\*\* being [ for the surface hardness of this rebound ace court layer ] 1.0-15.0 more than in 2H, and the center line average granularity (Ra) of a rebound ace court layer front face being 0.001-0.02 micrometers in the plastics layered product which prepared the rebound ace court layer in the field of at least one of the two of a plastics base material.

[Claim 2] The plus stick layered product according to claim 1 characterized by containing the resin with which a rebound ace court layer becomes an end from the macromolecular monomer which has a copolymerizable partial saturation double bond, and/or an acrylic polymer with the polyfunctional (meta) acrylate which has two or more acryloyl (meta) radicals in 1 molecule, and a particle, and carrying out processing association of the front face of this particle for this particle through an organic compound and a silyloxy radical by the fine-particles-like silica or colloidal silica.

[Claim 3] The plastics layered product according to claim 1 or 2 characterized by for the number average molecular weight to which the macromolecular monomer which has a copolymerizable partial saturation double bond at the end has an acryloyl (meta) radical at the end being the amount compound of macromolecules of 1,000-10,000, and the content after a polymerization and/or a reaction being 5 - 50 % of the weight among the solid content of the resin constituent of a rebound ace court layer.

[Claim 4] The acrylic acid / (meta) acrylic-acid alkyl ester copolymer to which an acrylic polymer uses an acrylic acid (meta) and acrylic-acid (meta) alkyl ester as an indispensable component, and comes to carry out a copolymer (meta), Or they are the styrene / acrylic copolymer to which it comes to carry out copolymerization of a styrene system monomer, and the acrylic acid (meta) / (meta) acrylic-acid alkyl ester copolymer as an indispensable component. The plastics layered product according to claim 1 or 2 characterized by for the weight average molecular weight being 5,000-100,000, and the content after a polymerization and/or a reaction being 5 - 50 % of the weight among the solid content of the resin constituent of a rebound ace court layer.

[Claim 5] The plastics layered product according to claim 1 to 4 characterized by a plastics base material consisting of polyester, acetate, or acrylate system resin.

[Claim 6] The plastics layered product according to claim 1 to 5 characterized by preparing an acid-resisting layer on a rebound ace court layer.

[Claim 7] The plastics layered product according to claim 6 which an acid-resisting layer consists of a multilayer layered product of a metallic oxide, and is characterized by the beam-of-light reflection factor in 480-650nm being 2% or less.

[Claim 8] The image display protection film which consists of a plastics layered product according to claim 1 to 7.

[Claim 9] The image display device which comes to stick a plastics layered product according to claim 1 to 8 on an image display side and/or the front face of the front plate through an adhesive layer or an adhesives layer.

[Claim 10] The plastics layered product to which this rebound ace court layer is characterized by

containing a polymerization and/or the resin made to come to react for a particle, the polyfunctional (meta) acrylate which has two or more acryloyl (meta) radicals in 1 molecule, and the macromolecular monomer which has a copolymerizable partial saturation double bond at the end and/or an acrylic polymer in the plastics layered product by which the laminating of a rebound ace court layer and the acid-resisting layer is carried out one by one to the field of at least one of the two of a plastics base material.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] Specifically, this invention relates to the suitable plastics layered product for protection films, such as a display display and an instrument display, a sheet keyboard, a face plate, a touch panel, etc., and an image display protection film about the plastics layered product excellent in surface hardness, abrasion resistance, and \*\*\*\*\*-proof.

[0002]

[Description of the Prior Art] Conventionally, the method of making rebound ace court layers, such as actinic-rays hardening mold resin and heat-curing mold resin, form on a plastics base material sheet at JP,5-162261,A, JP,8-197670,A, and JP,9-300549,A is proposed as an approach of giving abrasion resistance and surface hardness to a plastics base material sheet.

[0003]

[Problem(s) to be Solved by the Invention] However, in the above-mentioned plastics layered product, it turned out that it has the following troubles.

[0004] That is, although it had the sufficient surface hardness and the abrasion resistance for a rebound ace court layer in the above-mentioned conventional plastics layered product, since curl is large, a crack tended to go into a rebound ace court layer, and adhesion with a base material was also inadequate, and when used especially for a film, transit stability produced the not bad processible problem.

[0005] As a cure of this, fillers, such as a silica, are added in a rebound ace court layer, surface hardness and abrasion resistance are maintained, and the attempt which makes curl small is performed. However, when carrying out the laminating of the acid-resisting layer etc. on the rebound ace court layer to which it is in the middle of processing, and a filler deposits by this approach, for example, an appearance worsens, the filler to which adhesion with the layer on a rebound ace court layer falls carries out flesh-side projection in a base material opposite side, and is on processing, and problems, like a percent defective becomes large were produced.

[0006] The purpose of this invention has surface hardness and abrasion resistance, and there is little curl, and it is to offer the plastics layered product from which production yield with good and high adhesion is obtained.

[0007] Other purposes of this invention are to offer the image display protection film which consists of this plastics layered product, and the image display device which comes to use a plastics layered product.

[0008]

[Means for Solving the Problem] this invention persons were wholeheartedly attained industrially advantageously by this invention in which the purpose of this invention has the following configuration as a result of examination.

[0009] [1] The plastics layered product characterized by for front facing \*\*\*\*\* being [ for the surface hardness of this rebound ace court layer ] 1.0-15.0 more than in 2H, and the center line average granularity (Ra) of a rebound ace court layer front face being 0.001-0.02 micrometers in the plastics

layered product which prepared the rebound ace court layer in the field of at least one of the two of a plastics base material.

[0010] [2] a rebound ace court -- a layer -- one -- a molecule -- inside -- two -- a piece -- more than -- acryloyl (meta) -- a radical -- having -- polyfunctional (meta) -- acrylate -- a particle -- an end -- being copolymerizable -- partial saturation -- a double bond -- having -- a macromolecular monomer -- and/or -- acrylic -- a polymer -- from -- becoming -- resin -- containing -- this -- a particle -- fine particles -- \*\* -- a silica -- or -- colloidal silica -- this -- a particle -- a front face -- an organic compound -- silyloxy -- a radical -- minding -- processing -- association -- carrying out -- having -- \*\*\*\* -- things -- the description -- \*\* -- carrying out -- the above -- [-- one --] -- a publication -- plus -- a stick -- a layered product -- .

[0011] [3] A plastics layered product the above [1] characterized by for the number average molecular weight to which the macromolecular monomer which has a copolymerizable partial saturation double bond at the end has an acryloyl (meta) radical at the end being the amount compound of macromolecules of 1,000-10,000, and the content after a polymerization and/or a reaction being 5 - 50 % of the weight among the solid content of the resin constituent of a rebound ace court layer, or given in [2].

[0012] [4] The acrylic acid / (meta) acrylic-acid alkyl ester copolymer to which an acrylic polymer uses an acrylic acid (meta) and acrylic-acid (meta) alkyl ester as an indispensable component, and comes to carry out a copolymer (meta), Or they are the styrene / acrylic copolymer to which it comes to carry out copolymerization of a styrene system monomer, and the acrylic acid (meta) / (meta) acrylic-acid alkyl ester copolymer as an indispensable component. A plastics layered product the above [1] characterized by for the weight average molecular weight being 5,000-100,000, and the content after a polymerization and/or a reaction being 5 - 50 % of the weight among the solid content of the resin constituent of a rebound ace court layer, or given in [2].

[0013] [5] A plastics layered product given in either of above-mentioned [1] - [4] characterized by a plastics base material consisting of polyester, acetate, or acrylate system resin.

[0014] [6] A plastics layered product given in either of above-mentioned [1] - [5] characterized by preparing an acid-resisting layer on a rebound ace court layer.

[0015] [7] A plastics layered product given in the above [6] which an acid-resisting layer consists of a multilayer layered product of a metallic oxide, and is characterized by the beam-of-light reflection factor in 480-650nm being 2% or less.

[0016] [8] The above [1] Image display protection film which becomes either of - [8] from the plastics layered product of a publication.

[0017] [9] The above [1] Image display device which comes to stick a plastics layered product given in either of - [8] on an image display side and/or the front face of the front plate through an adhesive layer or an adhesives layer.

[0018] [10] The plastics layered product to which this rebound ace court layer is characterized by containing a polymerization and/or the resin made to come to react for a particle, the polyfunctional (meta) acrylate which has two or more acryloyl (meta) radicals in 1 molecule, and the macromolecular monomer which has a copolymerizable partial saturation double bond at the end and/or an acrylic polymer in the plastics layered product by which the laminating of a rebound ace court layer and the acid-resisting layer is carried out one by one to the field of at least one of the two of a plastics base material.

[0019]

[Embodiment of the Invention] The plastics layered product of this invention has the basic laminated structure which consists of a plastics base material and a rebound ace court layer.

[0020] Especially the plastics base material used for this invention is not limited, can be suitably chosen from well-known plastics base material sheets, and can be used. As such a plastics base material sheet, resin, such as for example, a polyester system, a polyethylene system, a polypropylene system, a diacetate system, a triacetate system, a polystyrene system, a polycarbonate system, the poly methyl pentene system, a polysulfone system, a polyether ethyl ketone system, a polyimide system, a fluorine system, a nylon system, and an acrylate system, is mentioned. It is more preferably used from the thing

excellent in homogeneity being easy to be obtained in these resin from an optical and reinforcement- [ polyester, acetate, and acrylate system resin ] viewpoint.

[0021] Especially, it excels in transparency and polyethylene terephthalate, triacetyl cellulose, or polymethylmethacrylate resin is preferably used at the point which does not have an anisotropy optically.

[0022] As for the above-mentioned plastics base material, it is desirable that it is a sheet-like, and the light transmission of Hayes in 400-800nm is [ the base material / 5% or less of thing ] desirable 40% or more. When not filling light transmission to 40%, or when Hayes is larger than 5% and it uses as display material, there is an inclination for clear nature to be missing. Moreover, the upper limit of light transmission of the lower limit of Hayes is the range where even about 0.1% is practical 99.5% at the point of demonstrating such effectiveness. It may not color and the above-mentioned plastics base material may be colored.

[0023] Before preparing a rebound ace court layer in the above-mentioned plastics base material used by this invention, various surface preparation (for example, corona discharge treatment, glow discharge processing, flame treatment, etching processing, a surface roughening process, etc.) and surface coating for promotion of adhesion (a polyurethane system, a polyester system, a polyester acrylate system, a polyurethane acrylate system, a poly epoxy acrylate system, titanate compound, etc.) may be performed. Especially the plastics base material that carried out the under coat of the constituent which consists of a copolymer which made hydrophilic-group content polyester resin graft-ize an acrylic compound, and a crosslinking bond agent improves an adhesive property, and is preferably used as a plastics base material sheet excellent in endurance, such as resistance to moist heat and priming-proof nature.

[0024] the thickness of the layer in the case of making these constituents into an under coat at a plastics base material -- usually -- 0.01 - 2 g/m<sup>2</sup> -- more -- desirable -- 0.1 - 1 g/m<sup>2</sup> it is -- the thickness of an under coat -- 0.01 g/m<sup>2</sup> applying to homogeneity, if thin -- difficult -- 2 g/m<sup>2</sup> If it exceeds, it is not difficultly desirable to obtain the layered product which was excellent in the surface hardness of the rebound ace court layer which carries out a laminating, and abrasion resistance on this.

[0025] 5-5000 micrometers of thickness of the plastics base material used by this invention are usually 10-3000 micrometers preferably from a mechanical strength and a thermally conductive point. Moreover, two or more sheets plastic can also be used as lamination and a still thicker plastics base material by the well-known approach.

[0026] The actinic-rays hardening mold resin which monomers, such as an acrylic of heat-curing resin, such as an acrylic, epoxy, polyester, polyurethane, and a polysiloxane, and many organic functions, urethane, polyester, and epoxy, a prepolymer, or a polymer is made to construct a bridge with an electron ray, ultraviolet rays, or a radiation, and is obtained as a component which constitutes the rebound ace court layer in this invention is mentioned.

[0027] The actinic-rays hardening mold resin made to come to construct a bridge with an electron ray, ultraviolet rays, or a radiation especially is used preferably, and the polyfunctional (meta) acrylate compound which has two or more acryloyl (meta) radicals (however, an acryloyl radical and a meta-acryloyl radical are omitted and displayed as an "acryloyl (meta) radical" by this invention) in 1 molecule can be used. The polyfunctional (meta) acrylate compound which has two or more acryloyl (meta) radicals in 1 molecule in this, The resin which becomes a particle and an end from the macromolecular monomer which has a copolymerizable partial saturation double bond, and/or an acrylic polymer is contained. This particle by the fine-particles-like silica or colloidal silica The rebound ace court layer which the front face of this particle becomes from the resin which comes to carry out processing association through an organic compound and a silyloxy radical is excellent in surface hardness and abrasion resistance, and it is more preferably used in respect of curl being small and being hard to produce a crack etc.

[0028] As a polyfunctional (meta) acrylate compound which has two or more acryloyl (meta) radicals in 1 molecule, the compound with which this alcoholic hydroxyl group of the polyhydric alcohol which has two or more alcoholic hydroxyl groups serves as an esterification object of two or more acrylic acids (meta) can be used into 1 molecule.

[0029] Specifically The acrylic-acid (meta) diester:ethylene GURIKORUJI (meta) acrylate of the alkylene glycol of the (a) carbon numbers 2-12, Propylene GURIKORUJI (meta) acrylate, 1, 4-butane JIORUJI (meta) acrylate, Neopentyl GURIKORUJI (meta) acrylate, 1,6-hexanediol (meta) acrylate, etc., (b) -- acrylate (meta) acid diester [ of polyoxy alkylene glycol ]: -- diethylene GURIKORUJI (meta) acrylate -- TORIECHIRENGURIKORUJI (meta) acrylate, tetra-ethylene GURIKORUJI (meta) acrylate, Zypro pyrene GURIKORUJI (meta) acrylate, polyethylene GURIKORUJI (meta) acrylate, The acrylic-acid (meta) diester of (c) polyhydric alcohol, such as polypropylene GURIKORUJI (meta) acrylate : Pen TAERISURITORUJI (meta) acrylate etc., (d) -- acrylic-acid (meta) diester [ of the ethylene oxide of the hydride of bisphenol A or bisphenol A, and a propylene oxide addition product ]: - a 2 and 2'-bis(4-acryloxy ethoxy phenyl) propane -- A 2 and 2'-bis(4-acryloxy propoxy phenyl) propane etc., (e) to the end isocyanate radical content compound which a diisocyanate compound and two or more alcoholic hydroxyl group-containing compound are made to react beforehand, and is obtained Furthermore, the urethane (meta) acrylate which has two or more (meth)acryloyloxy radicals in the intramolecular which alcoholic hydroxyl-group content (meta) acrylate is made to react, and is obtained And the epoxy (meta) acrylate which has two or more (meth)acryloyloxy radicals is mentioned to the intramolecular which an acrylic acid or a methacrylic acid is made to react to the compound which has two or more epoxy groups in (f) intramolecular, and is obtained.

[0030] As well as a degree of hardness and hardenability, since it excels in abrasion resistance and flexibility, especially the rebound ace court layer that contains at least one sort of a monomer which has three or more acryloyl (meta) radicals in 1 molecule is used preferably.

[0031] As a polyfunctional (meta) acrylate compound which has three or more acryloyl (meta) radicals in 1 molecule, the compound with which this hydroxyl group of the polyhydric alcohol which has three or more alcoholic hydroxyl groups serves as an esterification object of three or more acrylic acids (meta) is mentioned into 1 molecule.

[0032] As a concrete example, pen TAERISURITORUTORI (meta) acrylate, pentaerythritol tetrapod (meta) acrylate, JIPENTAERISURITORUTORI (meta) acrylate, dipentaerythritol tetrapod (meta) acrylate, dipentaerythritol PENTA (meta) acrylate, dipentaerythritol hexa (meta) acrylate, TORIMECHI roll pro pantry (meta) acrylate, etc. are mentioned. One sort or two sorts or more may be mixed and used for these monomers.

[0033] The operating rate of a monomer of having three or more acryloyl (meta) radicals in these 1 molecules has 50 - 95 desirable % of the weight to a resin solid content total amount. When the operating rate of the above-mentioned monomer is less than 50 % of the weight, the hardening coat which has sufficient abrasion resistance is hard to be obtained. Moreover, when the amount exceeds 95 % of the weight, contraction by the polymerization is large, distortion remains in a hardening coat, or the flexibility of a coat falls, and there is a problem which curls greatly in a hardening coat side further.

[0034] Furthermore, in this invention, the compound which has one ethylene nature partial saturation double bond in intramolecular may also be included. For example, methyl (meta) acrylate, ethyl (meta) acrylate, n- and i-propyl (meta) acrylate, n-, sec-, and t-butyl (meta) acrylate, 2-ethylhexyl (meta) acrylate, lauryl (meta) acrylate, Stearyl (meta) acrylate, methoxy ethyl (meta) acrylate, Ethoxyethyl (meta) acrylate, hydroxyethyl (meta) acrylate, Hydroxypropyl (meta) acrylate, polyethylene-glycol monochrome (meta) acrylate, Polypropylene-glycol monochrome (meta) acrylate, glycidyl (meta) acrylate, Tetrahydrofurfuryl (meta) acrylate, N-hydroxyethyl (meta) acrylamide, N-vinyl pyrrolidone, an N-vinyl-3-methyl pyrrolidone, an N-vinyl-5-methyl pyrrolidone, etc. are mentioned. In order to improve especially adhesion with a plastics base material, hydroxyethyl (meta) acrylate, hydroxypropyl (meta) acrylate, glycidyl (meta) acrylate, tetrahydrofurfuryl (meta) acrylate, N-vinyl pyrrolidone, etc. are desirable. these monomers -- one sort -- or two or more sorts may use it, mixing.

[0035] The macromolecular monomer which has a copolymerizable partial saturation double bond at the end can be used for the rebound ace court layer in this invention. for example, the high molecular compound which has an acryloyl (meta) radical at the end -- number average molecular weight -- desirable -- 1,000-10,000 -- about 2,000 to 6,000 thing is more preferably good. As for a giant-molecule part, what a principal component becomes from for example, a methyl methacrylate polymer, a styrene



polymer, styrene / acrylonitrile polymer, a butyl acrylate polymer, a silicone polymer, etc. is mentioned. As a high molecular compound which has an acryloyl (meta) radical, a macro monomer (AS-6, AN-6, AB-6, AK-32, etc.: Toagosei make) can be mentioned to such an end, for example. As for the operating rate of these macromolecular monomers, it is desirable that it is 5 - 50 % of the weight to a resin solid content total amount. It is 5 - 30 % of the weight more preferably.

[0036] As an acrylic polymer used by this invention, the acrylic acid / (meta) acrylic-acid alkyl ester copolymer which comes to carry out copolymerization of the alkyl ester to an acrylic acid (meta) as an indispensable component (meta), styrene / acrylic copolymer etc. to which it comes to carry out copolymerization of a styrene system monomer, an acrylic acid (meta), and/or its alkyl ester as an indispensable component are mentioned, for example, and, as for the weight average molecular weight, it is desirable that it is [ or more 5,000 ] 100,000 or less. The operating rate of these acrylic polymer is 5 - 50 % of the weight preferably to a resin solid content total amount.

[0037] In addition, when using together the macromolecular monomer which has a copolymerizable partial saturation double bond at the end, and an acrylic copolymer, it is desirable to blend so that both total amount may become 5 - 50 % of the weight to a resin solid content total amount.

[0038] As a particle used by this invention, a silicon compound, metallic compounds, high molecular compounds, or those mixture are mentioned. As a silicon compound, a wet silica, a dry type silica, or colloidal silica is mentioned as a silica particle, for example. Moreover, an alumina, a titania, a zirconia, etc. are mentioned as metallic compounds. Moreover, poly methyl (meta) acrylate resin etc. is mentioned as a high molecular compound. Moreover, conductive particles, such as tin oxide, indium oxide, cadmium oxide, and antimony oxide, are also mentioned.

[0039] In these particles, a silica particle is preferably used in respect of transparency, rebound ace court nature, etc. The specific surface area of a silica particle is 0.1-3000m<sup>2</sup>/g preferably, and is 10-1500m<sup>2</sup>/g more preferably.

[0040] The use gestalt of these silicas particle can be used after the powder, the water, or the organic solvent of dryness has distributed. Colloidal silica is desirable in order to require transparency especially. As for colloidal silica, the Snow tex 20, a methanol silica sol, IPA-ST, DMAC-ST, XBA-ST (above Nissan Chemical Industries, Ltd. make), etc. are mentioned as colloid dispersion liquid in water or an organic solvent in a particle-like silica particle. Moreover, as a powdered silica, Aerosil 130, Aerosil 300 (product made from Japanese Aerosil), etc. can be mentioned.

[0041] It is more more desirable still that it is the reactant silica particle which the silica particle has combined through an organic compound and a silyloxy radical by the fine-particles-like silica or colloidal silica in respect of the stability of the silica particle in a rebound ace court layer, dispersibility, transparency, the abrasion resistance of a paint film, \*\*\*\*\*-proof, adhesion, etc. The silica particle chosen from the organic compound, the fine-particles-like silica, or colloidal silica which contains a polymerization nature partial saturation radical, a hydrolysis nature silyl radical, an isocyanate radical, and a thio isocyanate radical in a molecule is mixed, a hydrolysis reaction is carried out, and a reactant silica particle is obtained by combining the above-mentioned organic compound and a silica particle chemically.

[0042] Moreover, a polymerization nature partial saturation radical is a component which carries out chemistry bridge formation between molecules through addition polymerization with an activity radical kind. As a polymerization nature partial saturation radical, an acryloxy radical, a meta-chestnut ROKISHI radical, a vinyl group, a propenyl radical, a swine dienyl radical, a styryl radical, etc. can be mentioned.

[0043] A hydrolysis nature silyl radical is a component combined with the silanol group which exists in the front face of a silica particle by hydrolysis and the condensation reaction. As a hydrolysis nature silyl radical, an alkoxy silyl radical, an acetoxyl group, an amino silyl radical, an oxime silyl radical, a hydride silyl radical, etc. can be mentioned.

[0044] The mean particle diameter of the particle in this invention is 0.001-20 micrometers preferably. In order to form a transparent hardening constituent, 0.001-2 micrometers of desirable particle diameter are 0.001-0.1 micrometers still more preferably. As a configuration, the shape of the shape of the shape

of a globular shape and porosity and hollow, tabular, and an indeterminate form etc. is mentioned, and by this invention, a hollow-like particle is preferably used in respect of transparency as it is spherical. [0045] The addition of a particle has 5 - 50 desirable % of the weight among resin solid content. When an addition is less than 5 % of the weight, sufficient degree of hardness is hard to be obtained, and there is a problem of a grain child's lack and the transparency of a paint film exceeding 50 % of the weight falling.

[0046] In this invention, although the approach of irradiating ultraviolet rays by making the compound presentation of a rebound ace court layer into a polymerization and/or the approach of making it react is mentioned, it is desirable to add a photopolymerization initiator to said constituent in this case.

[0047] As a concrete example of a photopolymerization initiator, acetophenone, 2, and 2-diethoxy acetophenone, p-dimethyl acetophenone, p-dimethylamino propiophenone, A benzophenone, 2-chlorobenzo phenon, 4, and 4'-dichloro benzophenone, A 4 and 4'-screw diethylamino benzophenone, a Michler's ketone, benzyl, A benzoin, benzoin methyl ether, benzoin ethyl ether, Benzoin iso-propyl ether, a methyl benzoIRUFO mate, p-isopropyl-alpha-hydroxy isobutyl phenon, An alpha-hydroxy isobutyl phenon, 2, and 2-dimethoxy-2-phenyl acetophenone, Carbonyl compounds, such as 1-hydroxy cyclohexyl phenyl ketone, Tetramethylthiurammonosulfide, tetramethylthiuramdisulfide, Peroxide compounds, such as sulfur compounds, such as a thioxan ton, 2-chloro thioxan ton, and 2-methylthio xanthone, benzoyl peroxide, and di-t-butyl peroxide, are mentioned. These photopolymerization initiators may be used independently and may be combined two or more sorts. 0.01 - 10 weight section is suitable for the amount of the photopolymerization initiator used among resin solid content.

[0048] Moreover, an electron ray or a radiation can be used as a polymerization and/or a reaction means as other approaches. When using an electron ray or a gamma ray, it is not necessary to necessarily add a polymerization initiator.

[0049] It is desirable to add well-known thermal polymerization inhibitors, such as hydroquinone, hydroquinone monomethyl ether or 2, and 5-t-butyl hydroquinone, to the compound presentation used by this invention, in order to prevent the dark reaction under the thermal polymerization and storage at the time of manufacture. The desirable addition of a thermal polymerization inhibitor is 0.005 - 0.05 % of the weight among resin solid content.

[0050] An organic solvent can be blended with the compound presentation used by this invention in the range which does not spoil the purpose of this invention for the purpose of improvement in the workability at the time of coating, and control of coating thickness.

[0051] It is easy to use the organic solvent whose boiling point is 50-150 degrees C as an organic solvent from the drying point before and behind the workability at the time of coating, and hardening. As a concrete example, cyclic ether system solvents, such as aromatic solvents, such as ketones, such as acetic-ester system solvents, such as alcohols solvents, such as a methanol, ethanol, and isopropyl alcohol, methyl acetate, ethyl acetate, and butyl acetate, an acetone, and a methyl ethyl ketone, and toluene, and dioxane, etc. can be mentioned. these solvents are independent -- it is -- two or more sorts can also be mixed and used.

[0052] Various kinds of additives can be blended with the compound presentation used by this invention in the range which does not spoil the purpose of this invention if needed. As such an additive, an anti-oxidant, a leveling agent, an antistatic agent, etc. are mentioned, for example.

[0053] Although ultraviolet rays, an electron ray, radiations (alpha rays, beta rays, gamma ray, etc.), etc. can be used for the polymerization of the compound presentation used by this invention, and/or a reaction, it is simple to use ultraviolet rays and it is more desirable. As a source of ultraviolet rays, an ultraviolet-rays fluorescent lamp, a low pressure mercury lamp, a high pressure mercury vapor lamp, an ultrahigh pressure mercury lamp, a xenon LGT, a carbon arc LGT, etc. can be mentioned. Moreover, its equipment is expensive, and although an electron ray or a radiation method needs the actuation under inert gas, it is advantageous in a spreading layer from the point which does not need to be made to contain [ photosensitizer / a photopolymerization initiator, ].

[0054] Furthermore, coloring agents, such as a pigment and a color, can also be blended and used for the constituent which constitutes a rebound ace court layer. When the coloring agent is contained, it is

desirable for light transmission with a wavelength of 550nm to be 40 - 80% as the above-mentioned plastics layered product.

[0055] Moreover, although the thickness of a rebound ace court layer is suitably chosen according to an application, it is usually 5 micrometers - 30 micrometers more preferably 3 micrometers - 50 micrometers. Less than 3 micrometers of surface hardness are [ the thickness of a rebound ace court layer ] insufficient, and a blemish becomes easy to be attached. Moreover, when exceeding 50 micrometers, the hardening film becomes weak, and when the plastics base material which prepared the rebound ace court layer is bent, a crack becomes easy to go into the hardening film.

[0056] The pencil degree of hardness of the rebound ace court layer in this invention needs to be more than 2H, and is usually about 3-4H. If a pencil degree of hardness is less than [ 2H ], sufficient degree of hardness is not obtained and it is not desirable.

[0057] The rebound ace court layer in this invention requires that front facing \*\*\*\*\* should be within the limits of 1.0-15.0. It is the parameter which shows this deposit of the filler which can be deleted, and by which the value of a characteristic is included in a rebound ace court layer. It imprints in the acid-resisting layer which this face powder that was able to be shaved when it could delete and the characteristic became larger than the above-mentioned range adhered to the film front face, for example, carried out the laminating further on the rebound ace court layer, and becomes the cause of an adhesion fall. As this value is small, it is more desirable to improvement in adhesion. However, it produces the problem of it being necessary to lose whether the quantity of a filler addition is decreased, in order to be able to delete and to make a characteristic small, and curl of a rebound ace court layer becoming large in this case, and being easy to generate a crack and is not desirable.

[0058] Next, the surface average of roughness height (Ra) of the rebound ace court layer in this invention requires that there should be 0.001-0.02 micrometers within the limits of 0.001-0.01 micrometers preferably. Adhesion falls and is not desirable when a film front face is distorted and it is visible, when Ra is larger than this range, or the laminating of the acid-resisting layer is carried out on this. Moreover, Ra worsens [ slipping on the front face of a film ] and is not desirable when small on the contrary.

[0059] In this invention, the acid-resisting layer which consists of a metallic oxide further can be formed on the rebound ace court layer formed on the sheet-like plastics base material. Inorganic substances, such as the laminating and magnesium fluoride of a high refractive-index compound and a low refractive-index compound, and silicon oxide, can be used for an acid-resisting layer. Although there are various things especially as a configuration of the light reflex prevention film, it is the following multilayer configurations which contain a dielectric layer and a conductor layer at least, and can also form using vacuum thin film formation techniques, such as vacuum evaporation and sputtering.

[0060] As a high refractive-index film ingredient, it is TiO<sub>2</sub>, ZrO<sub>2</sub>, ITO, SnO<sub>2</sub>, and Y<sub>2</sub>O<sub>3</sub>. And ZnO etc. is mentioned. SiO<sub>2</sub>, MgF<sub>2</sub>, etc. are mentioned as a low refractive index film ingredient. Moreover, ITO, SnO<sub>2</sub>, ZnO, etc. can make the duty as conductive film, and the duty as high refractive-index film have.

[0061] By this invention, it is also possible to carry out mediation insertion of the light absorption film, such as TiN<sub>x</sub>, Au and Ag, and NiO<sub>x</sub>, as a component, and various film configurations can be considered.

[0062] In the plastics layered product of this invention, since it specifically decreases reflected [ outdoor daylight ] at least from the wavelength of 480nm the large field of a visible ray and that a reflection factor is 0 - 2% within the limits of 650nm and visibility is raised, it is desirable. It is desirable especially in order that 1% or less of especially reflection factors may suppress people's eyes and mental fatigue to the minimum. Consequently, the reflected light of the light which has carried out incidence to components can be reduced by sticking a plastics layered product on the front face of alphabetic characters, such as a display, and display material components.

[0063] As a desirable mode of this invention, the clear layer of the hydrofuge and the oil-repellent layer whose contact angle of water of the range of 1-20nm thickness is 90 or more degs further can be prepared on an acid-resisting layer. The purpose which prepares a hydrophobic layer protects an acid-

resisting layer, and raises stain-resistant ability, and should just fill a military requirement. As an ingredient of a hydrophobic layer, the compound which has a hydrophobic group is good, for example, a perfluoro silane, fluorocarbon, etc. are mentioned. As the formation approach of a hydrophobic layer, the chemistry gaseous-phase depositing methods, such as the physical gaseous-phase depositing methods, such as vacuum evaporation and sputtering, and CVD, can be used according to an ingredient.

[0064] An adhesive layer can be prepared in the opposite side of the field which has the rebound ace court layer of a plastics base material in the plastics layered product of this invention. As an adhesive layer, especially if two bodies are pasted up according to the adhesion operation, it will not limit. As a binder which forms an adhesive layer, a rubber system, a vinyl polymerization system, a condensation-polymerization system, a thermosetting resin system, a silicone system, etc. can be used. In this, a swine JIEN-styrene copolymer system (SBR), a swine JIEN-acrylonitrile-copolymer system (NBR), a chloroprene polymer system, an isobutylene-isoprene copolymer system (isobutylene isoprene rubber), etc. can be mentioned as a binder of a rubber system. As a binder of a vinyl polymerization system, an acrylic resin system, a styrene resin system, a vinyl acetate-ethylene copolymer system, a vinyl chloride vinyl acetate copolymer system, etc. can be mentioned. A polyester resin system can be mentioned as a binder of a condensation-polymerization system. As a binder of a heat-curing resin system, an epoxy resin system, a urethane resin system, a formalin resin system, etc. can be mentioned. These resin may be used independently, and two or more sorts may use it, mixing.

[0065] Furthermore, a binder can use non-solvent mold either a solvent mold binder or a binder. Formation of an adhesive layer is carried out using techniques usually performed, such as spreading, using the above binders. Furthermore, an adhesive layer may be made to contain a coloring agent. This is easily attained by mixing and using coloring agents, such as a pigment and a color, for a binder. When the coloring agent is contained, it is desirable that it is within the limits whose light transmission in 550nm is 40 - 80% as a plastics layered product.

[0066] Next, although the manufacture approach of the plastics layered product of this invention is explained, this invention is not limited to this.

[0067] The plastics layered product of this invention is manufactured by the plastics base material spreading, a polymerization, and/or by making it react in a rebound ace court layer.

[0068] As a spreading means of a rebound ace court layer, the methods of application usually performed, such as brush coating, immersion coating, knife coating, spray coating, flow coating, and rotation coating (spinner etc.), can be used. There is the description in each method and the method of application is suitably chosen by the demand characteristics of a layered product, a use application, etc. The approach of irradiating activity energy lines using heat sources, such as steam, gas, or electrical and electric equipment, such as an approach, ultraviolet rays, and an electron ray, as the polymerization and/or the reaction approach of the compound presentation which forms a rebound ace court layer is mentioned.

[0069] The plastics layered product of this invention has high surface hardness, and since it has abrasion resistance, it can be used for an extensive application. For example, the plastics layered product of this invention can be used in fields, such as a filter for the Braun tubes (CRT), a membrane switch, a display, a face plate, and covering of an instrument. The film which carried out the laminating of the acid-resisting layer especially on the rebound ace court layer can be preferably used as an image display protection film.

[0070] Especially as an image display member, the Braun tubes (CRT), such as a liquid crystal display panel (LCD) and television KOMPYUTA, a plasma display (PDP), glass, etc. are mentioned, and it can consider as an image display device by equipping this image display side and/or its front plate.

[0071] Although especially a means to stick the plastics layered product created as mentioned above, an image display side, and/or the front face of the front plate is not limited For example, display material or a plastics base material is made to carry out spreading desiccation of the adhesive layer. By pasting up display material and a plastics base material through lamination and an adhesion material layer with a sticking-by-pressure roller etc. so that the rebound ace court layer and acid-resisting layer of a layered

product may turn into a surface The image display device equipped with the image display protection film which consists of a plastics layered product can be obtained.

[0072] Thus, the plastics layered product and image display protection film to which a surface crack cannot be attached easily are obtained by making the field of one of the two of a plastics base material carry out the laminating of the rebound ace court layer.

[0073] The measuring method of the property in this invention and the evaluation approach of effectiveness are as follows.

[0074] (1) It could delete, the film of a characteristic the angle of 50x50mm was piled up by the two-sheet rebound ace court police lineup, and it inserted into the cylinder of vertical thickness [ of 10mm ] x50phi, and it fixed from the bottom, having applied the 200g load, and the lower film was performed 30 times at the rate of per minute 50 rotation. It can delete in the rotated film front face of two sheets, and powder becomes punctate and looks white. This film front face could be deleted using the reflective mold differential interference microscope (product made from Japanese optics), and it asked for the area of powder using the micrometer which put in the ocular.

[0075] What \*\*\*\* has generated on the whole surface can be deleted with a stereoscopic microscope, expands the condition of an object, and tended to take and have been made to carry out the quantum of the photograph with an instant camera. On the photograph, it could be visible, and could delete, the whole surface product of an object was counted, and it expressed with cm<sup>2</sup>. The film of A and the bottom was set to B for the upper film, and the sum total of A+B could be shaved and it considered as the characteristic.

[0076] (2) Use a center line average-of-roughness-height omnipotent surface type-like measuring device (Kosaka Laboratory make), and it is JIS. It measured according to B-0601.

[0077] (3) Using wear-resistant steel wool #0000, 20 round-trip film front face was rubbed by the 200g load, the blemish stuck, and the following criteria estimated condition.

O : even if it rubs strongly, a blemish hardly sticks.

\*\* : If it rubs quite strongly, a blemish will attach a few.

x : A blemish also attaches weak friction.

[0078] (4) Use the pencil degree of hardness HEIDON (product made from New East Science), and it is JIS. It measured according to K-5400.

[0079] (5) Using the \*\*\*\*\*-proof touch pen, the film front face was ground against the 1kg load, the crack stuck, and the following criteria estimated condition.

O : a blemish does not stick.

\*\* : A little thin blemish sticks.

x : The blemish which is in sight clearly sticks.

[0080] (6) About the film which carried out the laminating of the acid-resisting layer on the adhesion rebound ace court layer, 20 round-trip grinding and a surface state were observed by the 1kg load using the absorbent cotton into which ethyl alcohol was infiltrated.

O : Change-less \*\* : The exfoliation which is a surface a part is accepted.

x : Exfoliation is accepted in the whole surface.

[0081] (7) The rebound ace court layer was put for the film cut in the magnitude of 10x10cm of curl on the top at the even place, the relief condition of both ends was observed, and the height from a flat surface was measured.

[0082] (8) The film cut in magnitude with a crack initiation curvature of 10x2cm was twisted around the cylinder which turns a rebound ace court layer up and has curvature, and the condition of the generating existence of a surface crack was observed.

[0083] (9) the condition of having turned the acid-resisting layer up and having twisted around the cylinder of 50phi the film cut in magnitude of 20x5cm about the film which carried out the laminating of the acid-resisting layer on the endurance rebound ace court layer -- the constant temperature of 40-degree-C90%RH -- adhesion evaluation was performed after leaving it in a constant humidity chamber for 24 hours.

O : with no change.

\*\* : Exfoliation is accepted in a part.

x : Exfoliation is accepted in the whole surface.

[0084] (10) It used the reflection factor spectrophotometer (Hitachi, Ltd.), and the reflection factor in 550nm was measured.

[0085]

[Example] Next, although this invention is explained based on an example, this invention is not limited to these examples.

[0086] 50 degrees C carried out heating churning at 70 degrees C after dropping over 1 hour for 3 hours, agitating the 1 and 3-bis(isocyanate methyl) cyclohexane 223 section in the solution which consists of the [example 1 of reference] mercapto propyltrimethoxysilane 221 section, and the dibutyl tin JIRAU rate 1 section. The pentaerythritol thoria chestnut rate 555 section was applied to this at 30 degrees C for 1 hour, after dropping, heating churning was carried out at 60 degrees C for 10 hours, and the silane compound was obtained.

[0087] The alt.formic acid methyl ester 18 section was added [ this silane compound 30 section ] for the mixed liquor of the MEK-ST(product [ made from Nissan Chemistry ], methyl-ethyl-ketone distribution colloidal silica (mean particle diameter of 0.01-0.015 micrometers), 30% of silica concentration) 233 section, the isopropyl alcohol 5 section, and the ion-exchange-water 3 section after 80-degree-C 3-hour churning under the nitrogen air current, heating churning was performed for 80 more degree-C 1 hour, and translucent silica dispersion liquid were obtained.

[0088] On one side of a polyethylene terephthalate film ("lumiler [ by Toray Industries, Inc. ]") with a [example 1] thickness of 188 micrometers The dipentaerythritol hexaacrylate (Nippon Kayaku Co., Ltd. make) 75 weight section, Macro monomer AN-6S (the Toagosei make and 50 % of the weight of solid content) The number-average-molecular-weight 6,000 10 weight section, silica dispersion liquid manufactured in the example 1 of reference (37 % of the weight of solid content) The content of a silica particle 54 70-% of the weight weight sections in solid content, the photoinitiator 1-hydroxy phenyl ketone (made in Tiba Speciality Chemicals) 5 weight section, The constituent which carried out stirring mixing of the toluene 50 weight section and the methyl-ethyl-ketone 50 weight section was applied so that the thickness after hardening might be set to 10 micrometers using bar coater, and the film which prepared the coat was created. The coat of the obtained film was left for 30 seconds with hot air drying equipment, and the bottom of the high pressure mercury vapor lamp which has the reinforcement of 80 W/cm which set the solvent to this paint film side from height with a height of 12cm after volatilizing was passed the rate for 3m/. The paint film was hardened completely. The performance-evaluation test result of the obtained paint film is shown in Table 1.

[0089] On one side of a polyethylene terephthalate film ("lumiler [ by Toray Industries, Inc. ]") with a [example 2] thickness of 188 micrometers the dipentaerythritol hexaacrylate 75 weight section and macro monomer AA-6 (the Toagosei make --) 40 % of the weight of solid content, the number-average-molecular-weight 6,000 12.5 weight section, the silica dispersion-liquid 54 weight section manufactured in the example 1 of reference, The photoinitiator 1-hydroxy phenyl ketone (made in Tiba Speciality Chemicals) 5 weight section, The constituent which carried out stirring mixing of the toluene 50 weight section and the methyl-ethyl-ketone 50 weight section was applied so that the thickness after hardening might be set to 10 micrometers using bar coater, and the film which prepared the coat was created. The coat of the obtained film was left for 30 seconds with hot air drying equipment, and the bottom of the high pressure mercury vapor lamp which has the reinforcement of 80 W/cm which set the solvent to this paint film side from height with a height of 12cm after volatilizing was passed the rate for 3m/. The paint film was hardened completely. The performance-evaluation test result of the obtained paint film is shown in Table 1.

On one side of a polyethylene terephthalate film ("lumiler [ by Toray Industries, Inc. ]") with a [example 3] thickness of 188 micrometers the dipentaerythritol hexaacrylate 66 weight section and macro monomer AN-6S (the Toagosei make --) 50 % of the weight of solid content, the number-average-molecular-weight 6,000 10 weight section, a styrene-acrylic copolymer (60% of solid content) The weight-average-molecular-weight 17,790 15 weight section, the silica dispersion-liquid 54 weight



section manufactured in the example 1 of reference, 1-hydroxy phenyl ketone The constituent which carried out stirring mixing of 5 weight sections, the toluene 50 weight section, and the methyl-ethyl-ketone 50 weight section was applied so that the thickness after hardening might be set to 10 micrometers using bar coater, and the film which prepared the coat was created. The coat of the obtained film was left for 30 seconds with hot air drying equipment, and the bottom of the high pressure mercury vapor lamp which has the reinforcement of 80 W/cm which set the solvent to this paint film side from height with a height of 12cm after volatilizing was passed the rate for 3m/. The paint film was hardened completely. The performance-evaluation test result of the obtained paint film is shown in Table 1.

[0090] On one side of a polyethylene terephthalate film ("lumiler [ by Toray Industries, Inc. ]") with a [example 4] thickness of 188 micrometers The dipentaerythritol hexaacrylate 68 weight section, a styrene-acrylic copolymer (60% of solid content) The weight-average-molecular-weight 17,790 20 weight section, the silica dispersion-liquid 54 weight section manufactured in the example 1 of reference, 1-hydroxy phenyl ketone The constituent which carried out stirring mixing of 5 weight sections, the toluene 50 weight section, and the methyl-ethyl-ketone 50 weight section was applied so that the thickness after hardening might be set to 10 micrometers using bar coater, and the film which prepared the coat was created. The coat of the obtained film was left for 30 seconds with hot air drying equipment, and the bottom of the high pressure mercury vapor lamp which has the reinforcement of 80 W/cm which set the solvent to this paint film side from height with a height of 12cm after volatilizing was passed the rate for 3m/. The paint film was hardened completely. The performance-evaluation test result of the obtained paint film is shown in Table 1.

[0091] On the rebound ace court layer obtained in the [example 5] example 1, the antireflection film was produced using the vacuum evaporation system so that it might become the antireflection film of the following configuration.

[0092]

	構成物質	光学膜厚 (n×d)
第1層	ITO	0.061λ
第2層	SiO <sub>2</sub>	0.089λ
第3層	ITO	0.539λ
第4層	MgF <sub>2</sub>	0.192λ

Next, perphloro trimethoxysilane was made to form on the acid-resisting layer which carried out in this way and was made to form, so that it may become the thickness of 2nm with a CVD method, and the film was obtained. The performance-evaluation test result of the obtained paint film is shown in Table 1.

[0093] The film which prepared the acid-resisting layer and the hydrophobic layer for the rebound ace court layer in the triacetate film ("FUJITAKKU[ by Fuji Photo Film Co., Ltd. ]") with a [example 6] thickness of 80 micrometers like the example 5 like the example 1 was created. A result is shown for the performance evaluation test of the obtained paint film in Table 1.

[0094] The constituent which carried out stirring mixing of the dipentaerythritol hexaacrylate (Nippon Kayaku [ Co., Ltd. ] Co., Ltd. make) 100 weight section, the photoinitiator 1-hydroxy phenyl ketone (made in Tiba Speciality Chemicals) 5 weight section, the toluene 50 weight section, and the methyl-ethyl-ketone 50 weight section for the [example 1 of comparison] rebound ace court layer was used, and also the rebound ace court layer was produced by the same approach as an example 1. The performance-evaluation test result of the obtained paint film is shown in Table 1.

[0095] The constituent which carried out stirring mixing of the dipentaerythritol hexaacrylate (Nippon Kayaku [ Co., Ltd. ] Co., Ltd. make) 90 weight section, the macro monomer AN-6S (50 % of the weight [ of solid content ], number average molecular weight 6,000) 20 weight section, the photoinitiator 1-hydroxy phenyl ketone (made in Tiba Speciality Chemicals) 5 weight section, the toluene 50 weight section, and the methyl-ethyl-ketone 50 weight section for the [example 2 of comparison] rebound ace court layer was used, and also the rebound ace court layer was produced by the same approach as an

example 1. The performance-evaluation test result of the obtained paint film is shown in Table 1.

[0096] The [example 3 of comparison] rebound ace court layer The dipentaerythritol hexaacrylate (Nippon Kayaku [ Co., Ltd. ] Co., Ltd. make) 85 weight section, The macro monomer AN-6S (50 % of the weight [ of solid content ], number average molecular weight 6,000) 20 weight section, silica powder (: made from the Fuji SHIRISHIA chemistry -- the SAIRISHIA 310(mean particle diameter of 1.4 micrometers) 5 weight section --) The constituent which carried out stirring mixing of the photoinitiator 1-hydroxy phenyl ketone (made in Tiba Speciality Chemicals) 5 weight section, the toluene 50 weight section, and the methyl-ethyl-ketone 50 weight section was used, and also the rebound ace court layer was produced by the same approach as an example 1. The performance-evaluation test result of the obtained paint film is shown in Table 1.

[0097] The film which prepared the acid-resisting layer and the hydrophobic layer like the example 5, respectively on the rebound ace court film obtained in the example 3 of the [example 4 of comparison] comparison was created. A result is shown for the performance evaluation test of the obtained paint film in Table 1.

[0098] In order to stick the plastics layered product obtained in the [example 7] example 5 on glass, after using AGR-100 (Nippon Kayaku Co., Ltd. make) for the field which has not given the acid-resisting layer as a binder and sticking on it with glass, it was made to harden in the amount of UV irradiation of 1,000 mj/cm<sup>2</sup>. A test result is shown in Table 1.

[0099]

[Table 1]

	削れ 指数	平均粗 さ μm	耐摩 耗性	鉛筆 硬度	耐引ッ 張き性	密着 性	3-5 (mm)	クラック (φ)	耐久 性	反射率 (%)
実施例 1	9.8	0.0015	○	4H	○	—	10	20	—	0.6
実施例 2	8.3	0.0014	○	4H	○	—	10	20	—	0.5
実施例 3	12.1	0.0026	○	4H	○	—	5	15	—	0.6
実施例 4	11.8	0.0023	○	4H	○	—	5	15	—	0.6
実施例 5	—	—	○	4H	○	○	10	20	○	0.6
実施例 6	—	—	○	4H	○	○	10	20	○	0.6
比較例 1	0.5	0.0004	○	4H	○	—	60	50	—	—
比較例 2	6.7	0.0004	○	3H	△	—	10	20	—	—
比較例 3	22.7	0.1100	△	3H	△	—	10	20	—	0.6
比較例 4	—	—	△	3H	△	△	10	20	×	0.6
実施例 7	—	—	○	4H	○	○	—	—	○	0.6

Examples 1-6 were good in all evaluation criteria.

[0100] It could delete, and since a characteristic and the center line average of roughness height were



lower than this invention within the limits, the example 1 of a comparison had large curl, and was large.  
[ of the generating curvature of a crack ]

[0101] Since the example 2 of a comparison had the center line average of roughness height lower than this invention within the limits, its \*\*\*\*\*-proof was low and it was inadequate. [ of \*\*\*\*\* ]

[0102] Since it could delete and the characteristic exceeded this invention within the limits, the example 3 of a comparison had abrasion resistance and inadequate \*\*\*\*\*-proof.

[0103] The example 4 of a comparison had inadequate adhesion and endurance with an acid-resisting layer.

[0104] The example 7 was good in all evaluation criteria as lamination and display material on glass.

[0105] It replaced with the glass of the [examples 8-10] example 7, the front face of a display screen of the 17 inch television Braun tube (CRT), a liquid crystal display panel (LCD), and a plasma display (PDP) was equipped with the plastics layered product obtained in the example 1 like the example 6, and the image display device was obtained. A crack was not attached but the reflection factor of each of abrasion resistance and \*\*\*\*\*-proof was also good in all evaluation criteria as display material at 0.6%.

[0106]

[Effect of the Invention] The effectiveness which was excellent in this invention occurs by having rationalized the range of front facing \*\*\*\*\* of a rebound ace court layer, and the surface average of roughness height (Ra). That is, according to this invention, the pencil degree of hardness of a rebound ace court layer, \*\*\*\*\*-proof, and abrasion resistance are good, and curl is small, and even when the laminating of the film, such as an acid-resisting layer, is carried out especially on a rebound ace court layer, the plastics layered product to which adhesion and endurance do so the remarkable effectiveness of being good is obtained. And this plastics layered product is suitably used as an image display protection film of various image display devices.

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[Translation done.]